

**RFI Report for  
Area of Concern 49-008(b)  
at Technical Area 49  
(Potential Area of Surface  
Contamination at Area 6 East)**

Produced by the Material Disposal Areas Focus Area

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## EXECUTIVE SUMMARY

Area of concern (AOC) 49-008(b) is an area of potential surface soil contamination located within a section of Los Alamos National Laboratory (LANL) Technical Area 49 (TA-49) that is referred to as Area 6 East. The eastern section of Area 6 was developed as a general support area early in the TA-49 hydronuclear program. Area 6 East originally contained storage and office buildings, crafts structures, and an area, referred to as the boneyard, which was used to store lumber, fencing, steel, cable, pipes, and sand. Anecdotal information suggests that a small lead-casting shop may have operated briefly in this area; however, there are no documented releases for AOC 49-008(b). Radioactive materials were strictly controlled at TA-49, and radioactively contaminated materials were sorted and stored in an area separate from AOC 49-008(b). Although it is possible that trace amounts of radioactivity may have been present on materials temporarily stored in the area, or tracked into the AOC from other areas, due to the strict controls in place at TA-49, such contamination would have been localized and cleaned up immediately.

In August 1995, a Phase I Resource Conservation and Recovery Act (RCRA) facility investigation (RFI) was conducted at this site to determine if contamination from operational releases was present in the surface soil at the site. RFI sampling identified two inorganic chemicals of potential concern (COPCs) above soil background values (BVs): mercury and thallium. Contaminant extent was established, and the residual COPCs were found to pose no potential unacceptable risk to human or ecological receptors. Therefore, AOC 49-008(b) is recommended for no further action (NFA) under criterion 5 (Table ES-1). This criterion states that the site has been characterized or remediated in accordance with applicable state and/or federal regulations, and that the available data indicate that chemicals of concern are either not present or are present at concentrations that would pose no potential unacceptable human health or ecological risk under projected future land use.

**Table ES-1**  
**Summary of Proposed Actions**

AOC Number	AOC Description	HSWA <sup>a</sup>	Radionuclide Component <sup>b</sup>	Proposed Action	Rationale for Recommendation
49-008(b)	Area of potential surface contamination	No	Yes	NFA, criterion 5 <sup>c</sup>	The site was characterized and the available data indicate that contaminants pose no potential unacceptable level of risk under current and projected land use.

<sup>a</sup> Indicates whether the site is listed in the Hazardous and Solid Waste Amendments (HSWA) module, Module VIII, of the Laboratory's Hazardous Waste Facility Permit.

<sup>b</sup> Indicates whether the site has a radionuclide component. This document contains data regarding radioactive wastes, the management of which is regulated under the Atomic Energy Act and specifically excluded from regulation under the Resources Conservation and Recovery Act. Thus, the US Department of Energy (DOE) is the regulatory authority for this AOC.

<sup>c</sup> NFA criteria are listed in Section II.B.4.a.(4).(b) of the New Mexico Environment Department (NMED) "RCRA Permits Management Program Document Requirement Guide" (NMED 1998, 57897).



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## Acronyms and Abbreviations

AOC	area of concern
BV	background value
COPC	chemical of potential concern
COPEC	chemical of potential ecological concern
DOE	Department of Energy
EMO	Emergency Management Office
EPA	Environmental Protection Agency
ER	Environmental Restoration
ESL	ecological screening level
FIDLER	field instrument for detection of low-energy radiation
HI	hazard index
HQ	hazard quotient
HSWA	Hazardous and Solid Waste Amendments
IWP	installation work plan
LANL	Los Alamos National Laboratory
NFA	no further action
NMED	New Mexico Environment Department
OU	operable unit
PRS	potential release site
RCRA	Resource Conservation and Recovery Act
RFI	RCRA facility investigation
RRES-R	Risk Reduction and Environmental Stewardship Remediation Program
SAL	screening action level
SWMU	solid waste management unit
TA	technical area
TAL	target analyte list

## Metric to English Conversions

Multiply SI (Metric) Unit	by	To Obtain US Customary Unit
kilometers (km)	0.622	miles (mi)
kilometers (km)	3281	feet (ft)
meters (m)	3.281	feet (ft)
meters (m)	39.37	inches (in.)
centimeters (cm)	0.03281	feet (ft)
centimeters (cm)	0.394	inches (in.)
millimeters (mm)	0.0394	inches (in.)
micrometers or microns ( $\mu\text{m}$ )	0.0000394	inches (in.)
square kilometers ( $\text{km}^2$ )	0.3861	square miles ( $\text{mi}^2$ )
hectares (ha)	2.5	Acres
square meters ( $\text{m}^2$ )	10.764	square feet ( $\text{ft}^2$ )
cubic meters ( $\text{m}^3$ )	35.31	cubic feet ( $\text{ft}^3$ )
kilograms (kg)	2.2046	pounds (lb)
grams (g)	0.0353	ounces (oz)
grams per cubic centimeter ( $\text{g/cm}^3$ )	62.422	pounds per cubic foot ( $\text{lb/ft}^3$ )
milligrams per kilogram ( $\text{mg/kg}$ )	1	parts per million (ppm)
micrograms per gram ( $\mu\text{g/g}$ )	1	parts per million (ppm)
liters (l)	0.26	gallons (gal.)
milligrams per liter ( $\text{mg/l}$ )	1	parts per million (ppm)
degrees Celsius ( $^{\circ}\text{C}$ )	$9/5 + 32$	degrees Fahrenheit ( $^{\circ}\text{F}$ )

## 1.0 INTRODUCTION

Los Alamos National Laboratory (LANL, or the Laboratory) is a multidisciplinary research facility owned by the US Department of Energy (DOE) and managed by the University of California. The Laboratory is located in north-central New Mexico, approximately 60 mi northeast of Albuquerque and 20 mi northwest of Santa Fe. The Laboratory covers 43 mi<sup>2</sup> of the Pajarito Plateau, which consists of a series of fingerlike mesas separated by deep canyons containing ephemeral and intermittent streams that run from west to east. Mesa tops range in elevation from approximately 6200 ft to 7800 ft. The eastern portion of the plateau stands 300 to 900 ft above the Rio Grande.

The Laboratory's Risk Reduction and Environmental Stewardship Remediation Program (RRES-R; formerly the Environmental Restoration [ER] Project) is involved in a national DOE effort to clean up facilities that were formerly involved in weapons production and research. The goal of the RRES-R Program is to ensure that DOE's past operations do not threaten human or environmental health and safety in and around Los Alamos County, New Mexico. To achieve that goal, the RRES-R Program is investigating sites potentially contaminated by past Laboratory operations.

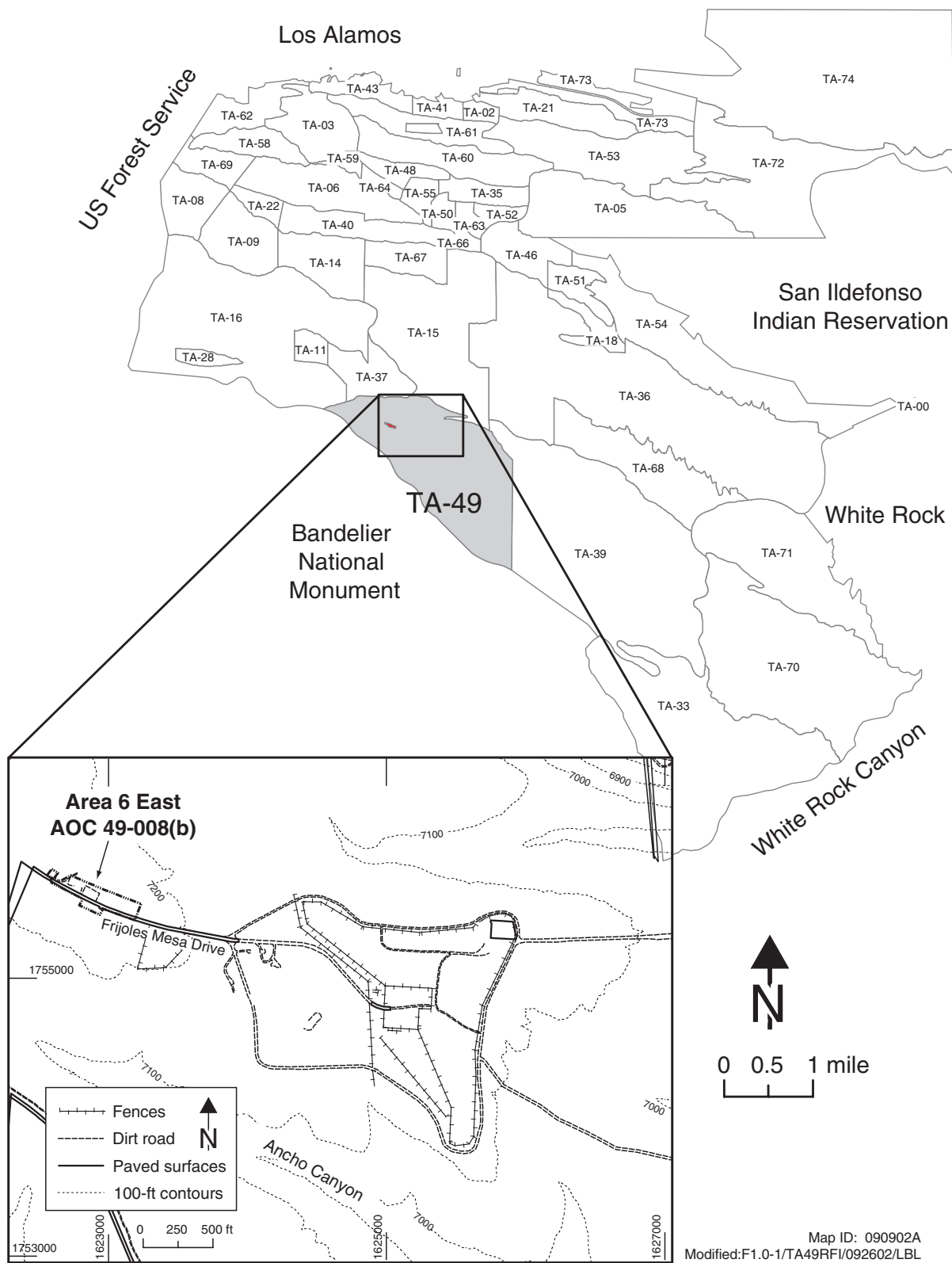
This Phase I Resource Conservation and Recovery Act (RCRA) RCRA facility investigation (RFI) report addresses the characterization of area of concern (AOC) 49-008(b), which is located within Area G of Technical Area 49 (TA-49) (Figure 1.0-1). This AOC consists of an area of potential surface soil contamination designated as AOC 49-008(b) and is not listed in Module VIII of the Laboratory's Hazardous Waste Facility Permit (EPA 1990, 1585; EPA 1994, 44146). However, AOC 49-008(b) is included in Appendix C of the "Solid Waste Management Unit Report" (LANL 1990, 07511).

This investigation, including sampling and analyses, was conducted in accordance with the "RFI Work Plan for Operable Unit (OU) 1144" (LANL 1992, 07670.1). AOC 49-008(b) has a radionuclide component. Radionuclide contamination levels are regulated by DOE Order 5400.5, "Radiation Protection of the Public and the Environment." The installation work plan (IWP) describes the methodologies used in this investigation (LANL 1998, 62060).

The objectives of this Phase I RFI were to

- identify site information and collect environmental data, as necessary;
- characterize the nature and extent of any contaminant release(s) (if present); and
- evaluate the potential risk to human health and the environment.

Section 2.0 of this report discusses the site description and operational history, the field investigations, the analytical results, and the human and ecological assessments for AOC 49-008(b). Appendix A presents the ecological scoping checklist for this site. All analytical data are included in Appendix B, and Appendix C presents the surface water assessment for the AOC.



**Figure 1.0-1. Location of TA-49 with respect to other Laboratory technical areas and surrounding land holdings**

## **2.0 AOC 49-008(b)—AREA OF POTENTIAL SURFACE SOIL CONTAMINATION**

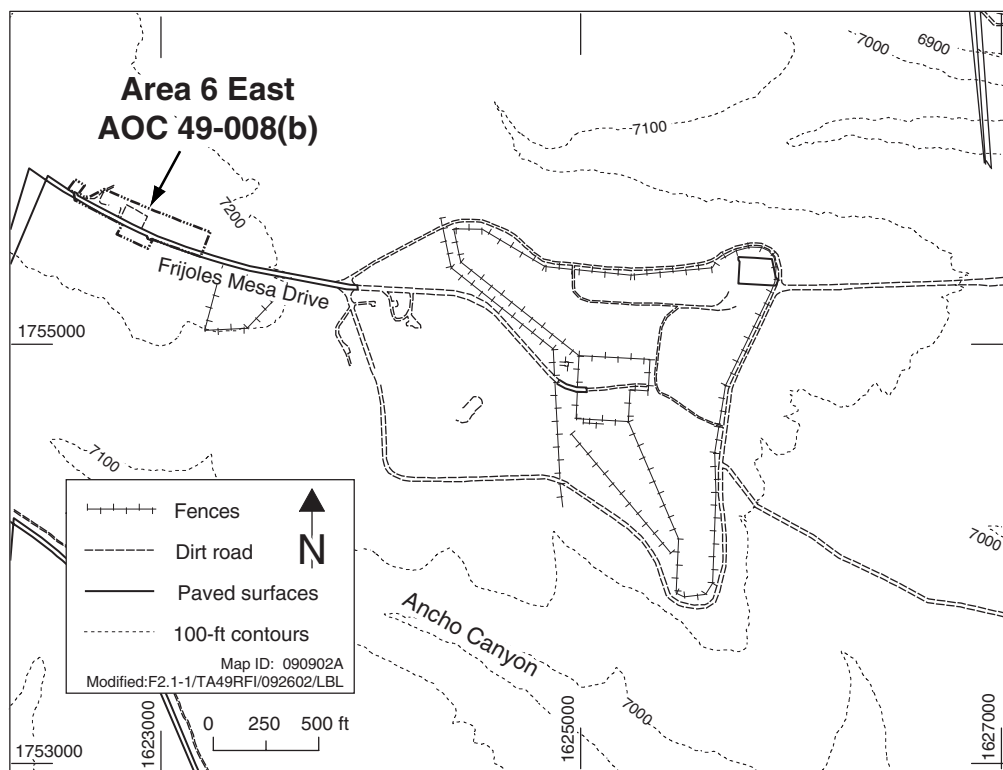
### **2.1 Site Description and Operational History**

AOC 49-008(b) is an area of potential surface soil contamination located within a section of TA-49 referred to as Area 6 East (Figure 1.0-1). Area 6 East consists of approximately 2 acres of graded surfaces located to the north and south of Frijoles Mesa Drive. The southern portion extends about 50 ft south of the road for 170 ft, and the northern portion extends 120 ft north of the road for about 600 ft. Both areas are recognizable by a graded surface made up of the original compacted base course material. The northern portion contains Building 49-115 (used for office and storage space) and two portable storage trailers (49-131 and 49-132); the southern portion contains no structures (Figure 2.1-1).

AOC 49-008(b) is located west of TA-49's central test area in a flat area (slope <10%), so runoff and erosion potential are minimal (see section 2.3.3). There are no established runoff channels, and any surface water movement would only occur as sheet flow during strong rainfall events or rapid snowmelt. There are no sources of water at or near the site.

TA-49, also known as Frijoles Mesa, occupies approximately 1280 acres along the south-central boundary of the Laboratory and is bounded by Bandelier National Monument to the south and west and by other Laboratory TAs to the north and east. TA-49 was constructed in the fall of 1959 and was the site of 60 subsurface hydronuclear experiments conducted in the early 1960s. These experiments, which were conducted in the central portion of the TA, were designed to help assess the danger related to accidental detonation of the high explosives component of a device. Hydronuclear experiments ended in 1961. Since then, only portions of TA-49 have been used by the Laboratory's High Power Microwave Group, NIS-10. Along Frijoles Mesa Drive, before the central portion of TA-49, the eastern section of Area 6 was developed as a general support area early in the hydronuclear program. The area contained storage and office buildings, crafts structures, and a storage area referred to as the boneyard for lumber, fencing, steel, cable, pipes, and sand. In addition, a lead-casting shop may have been present within Area 6 East for the casting/recasting of shielding bricks for calibration chambers and detonation experiments. By August 1961, the area contained an office building, two crafts shacks, two storage buildings, a tool building, a carpenter/electrician shed, and a latrine (LANL 1992, 07670.1).

To maintain a separation between construction support activities and experimental testing activities, as well as for security and safety reasons, Area 6 East was deliberately placed away from the central testing area. There were no documented releases during the period of operation. All the former structures were removed in 1977. Subsequently, Building 49-115 (used for equipment development and storage) and five storage trailers were located in the area. Currently, the area contains Building 49-115 and two storage trailers (structures 49-131 and 49-132) which are used for equipment development and storage related to the microwave testing taking place at the eastern portion of TA-49 (Figure 2.1-2).



**Figure 2.1-1. Location of AOC 49-008(b) within TA-49**

### 2.1.1 Land Use

AOC 49-008(b) is situated within an industrial area used by the Laboratory's High Power Microwave Group, NIS-10 (LANL 1994, 57224.1). TA-49, which is controlled by the Emergency Management Office (EMO), is behind a locked security fence and functions as a buffer to the firing sites to the north.

For the operational life of the Laboratory, for this portion of TA-49, the Laboratory does not anticipate any change from industrial use with restricted access (LANL 1994, 57224.1). All of TA-49 will remain under institutional control indefinitely as a southern boundary buffer for the Laboratory and for adjacent firing sites.

## 2.2 Investigation Activities

No previous investigations have been conducted at AOC 49-008(b).

### 2.2.1 Preliminary Conceptual Model

No documented releases occurred at AOC 49-008(b). Due to the possible operation of a small lead-casting shop and/or the storage of metal supplies (some of which may have had low-level radioactive contamination), potential contaminants are metals and radionuclides. The exact location of these activities within the graded surface of Area 6 East is unknown. The conceptual model for off-site transport to receptors is via surface runoff and infiltration. The flat graded surface of the area limits the potential for migration by means of surface runoff. Additionally, the depth to groundwater (approximately 950 ft below the mesa top), in combination with the semi-arid site conditions and low surface contamination levels, precludes infiltration as a viable pathway to the regional aquifer. No perched groundwater is present.

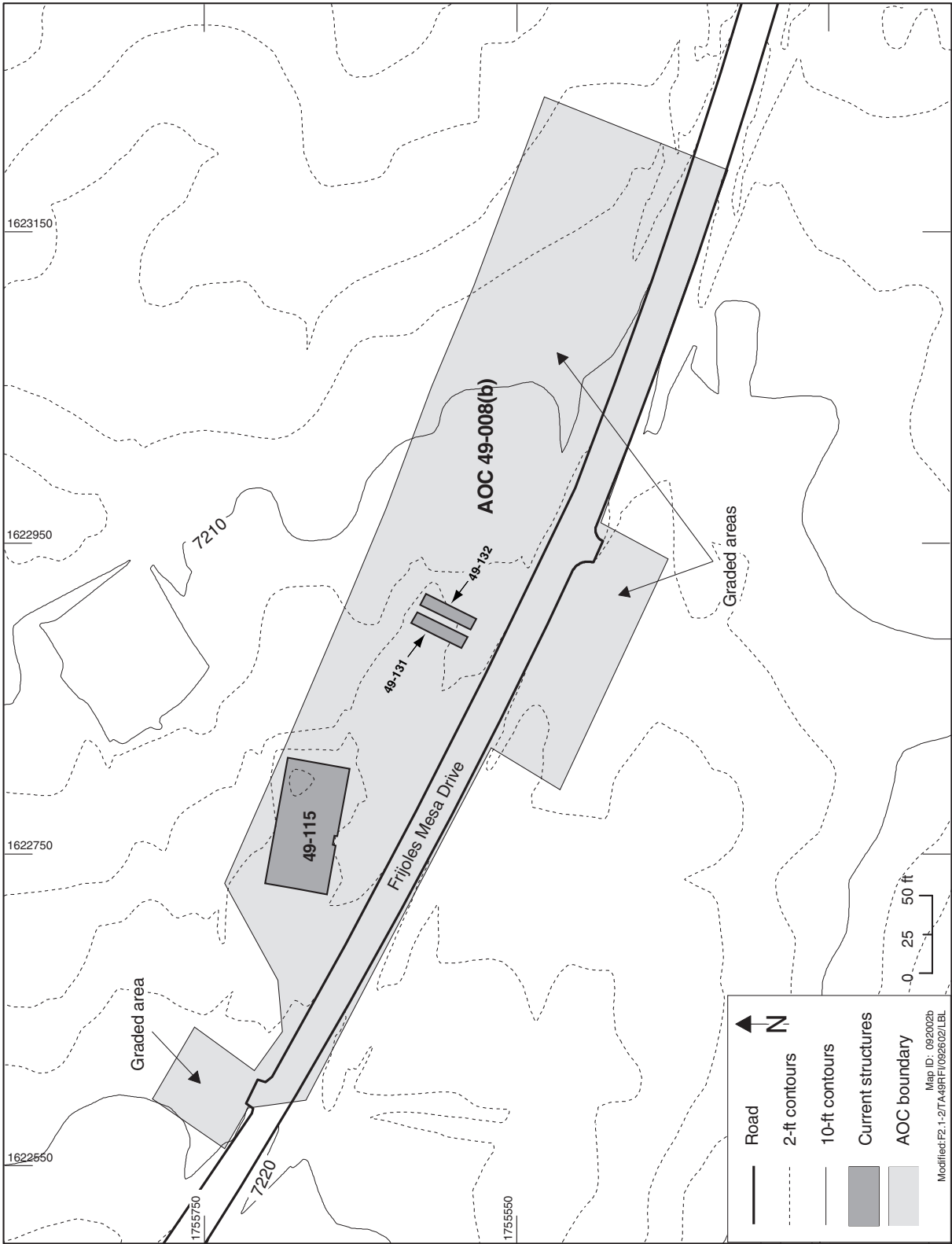


Figure 2.1-2. AOC 49-008(b) site map

The complete pathways from surface soil to potential human receptors are dermal contact, inhalation of fugitive dust, and incidental ingestion of soil. For ecological receptors, the potentially complete exposure pathways are root uptake, inhalation/deposition of particulates, incidental soil ingestion, and food web transport. The ecological scoping checklist for AOC 49-008(b) is included as Appendix A.

### 2.2.2 Phase I RFI Fieldwork

Prior to the collection of Phase I RFI samples, a radiological survey was performed across the site (all of Area 6 East) using a field instrument for detection of low-energy radiation (FIDLER). The survey was completed as specified in the approved RFI work plan (LANL 1992, 07670.1). A 40-ft grid (75 points) was established across the site, extending beyond the base course area and into the surrounding undisturbed areas. All screening measurements were within three standard deviations of mean background (Art 1996, 55332). Because no elevated concentrations were identified by the FIDLER survey, analytical sampling locations were selected randomly from the grid.

In August 1995, twenty-one surface soil samples were collected from AOC 49-008(b), including two duplicates. Twelve samples were analyzed for target analyte list (TAL) metals and isotopic plutonium, while all twenty-one samples were analyzed by gamma spectroscopy. (Additional samples were analyzed by gamma spectroscopy to confirm the FIDLER survey results.) Sampling was conducted in accordance with the approved RFI work plan (LANL 1992, 07670.1). Phase I RFI sample locations are shown in Figure 2.2-1. Table 2.2-1 lists all samples collected and the requested analyses for each sample.

**Table 2.2-1**  
**Samples Collected During 1995 Phase I RFI at AOC 49-008(b)**

Sample ID	Location ID	Depth (ft)	Media	TAL Metals	Uranium	Gamma Spectroscopy	Isotopic Plutonium
0549-95-0294	49-06000	0-0.5	Soil	783 <sup>a</sup>	786	786	786
0549-95-0295	49-06006	0-0.5	Soil	—	—	786	—
0549-95-0296	49-06016	0-0.5	Soil	—	—	786	—
0549-95-0297	49-06017	0-0.5	Soil	783	786	786	786
0549-95-0298	49-06020	0-0.5	Soil	—	—	786	—
0549-95-0299	49-06028	0-0.5	Soil	—	—	786	—
0549-95-0300	49-06031	0-0.5	Soil	783	786	786	786
0549-95-0301	49-06034	0-0.5	Soil	783	786	786	786
0549-95-0302	49-06039	0-0.5	Soil	783	786	786	786
0549-95-0303	49-06050	0-0.5	Soil	—	—	786	—
0549-95-0304	49-06052	0-0.5	Soil	—	—	786	—
0549-95-0305	49-06053	0-0.5	Soil	783	786	786	786
0549-95-0306	49-06066	0-0.5	Soil	783	786	786	786
0549-95-0307	49-06066	0-0.5	Soil	783	786	786	786
0549-95-0308	49-06067	0-0.5	Soil	783	786	786	786
0549-95-0309	49-06068	0-0.5	Soil	783	786	786	786
0549-95-0310	49-06069	0-0.5	Soil	783	786	786	786
0549-95-0311	49-06069	0-0.5	Soil	783	786	786	786
0549-95-0312	49-06070	0-0.5	Soil	—	—	786	—
0549-95-0313	49-06077	0-0.5	Soil	—	—	786	—
0549-95-0314	49-06079	0-0.5	Soil	—	—	786	—

<sup>a</sup> Sample request numbers.

<sup>b</sup> — = analysis not requested.

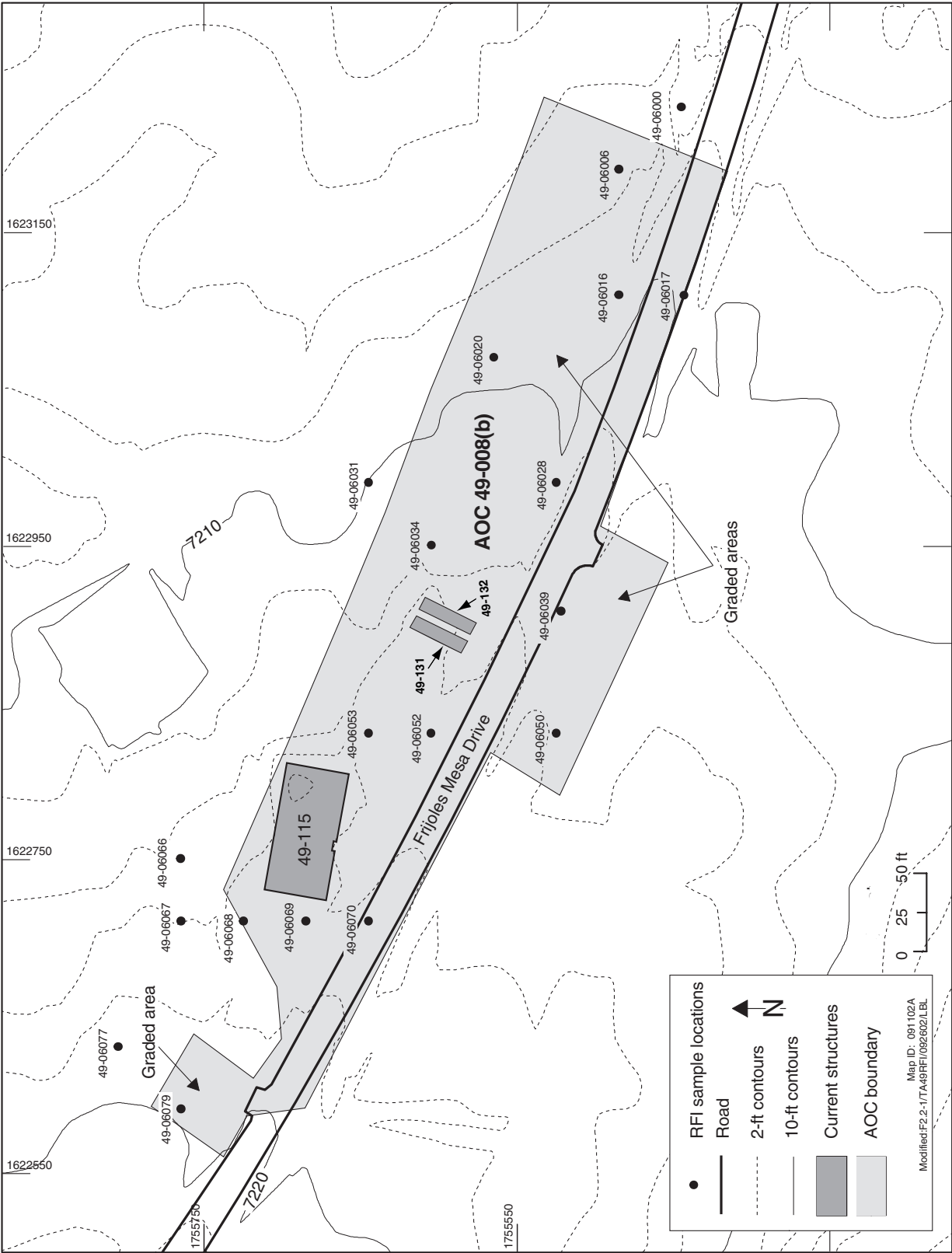


Figure 2.2-1. Phase I RFI sample locations at AOC 49-008(b)

## 2.2.3 Data Review

All analytical data for AOC 49-008(b) are included in Appendix B.

### 2.2.3.1 Inorganic Chemical Comparison with BVs

Table 2.2-2 presents the frequency of concentrations above background values (BVs) for the inorganic chemicals detected at AOC 49-008(b). In three samples, cadmium was detected above the soil BV. The sample concentrations (0.46 mg/kg, 0.51 mg/kg, and 0.51 mg/kg) were within the range of cadmium concentrations reported in the Laboratory's background data set (0.2 mg/kg to 2.6 mg/kg; LANL 1998, 59730.2). Mercury was detected in one sample at 0.11 mg/kg, compared to the 0.1 mg/kg soil BV. Thallium was detected in one sample (1.3 mg/kg) above the soil BV (0.73 mg/kg), and it had detection limits that were elevated above the BV in eleven samples (1.2 mg/kg and 1.3 mg/kg). The detected concentration and the elevated detection limits are outside of the range of concentrations in the background data set (0.063 mg/kg to 1.0 mg/kg; LANL 1998, 59730.2). The samples with detected concentrations of mercury and thallium are presented in Table 2.2-3 and Figure 2.2-2. Based on comparison with their BVs, mercury and thallium are identified as chemicals of potential concern (COPCs) and carried forward to the screening assessment.

**Table 2.2-2**  
**Frequency of Detected Inorganic Chemicals Above BVs<sup>a</sup> at AOC 49-008(b)**

Analyte	Media	Number of Analyses	Number of Detects	Concentration Range (mg/kg)	Background Value (mg/kg)	Frequency of Detects Above BV	Frequency of Nondetects Above BV
Aluminum	Soil	12	12	2160 to 21000	29200	0/12	0/12
Antimony	Soil	12	0	[0.66 to 0.7] <sup>b</sup>	0.83	0/12	0/12
Arsenic	Soil	12	0	[0.97 to 4.3]	8.17	0/12	0/12
Barium	Soil	12	12	73.2 to 208	295	0/12	0/12
Beryllium	Soil	12	9	[0.08] to 1.1	1.83	0/12	0/12
Cadmium	Soil	12	8	[0.17] to 0.51	0.4	3/12	0/12
Calcium	Soil	12	12	1780 to 2810	6120	0/12	0/12
Chromium (total)	Soil	12	12	4 to 13.1	19.3	0/12	0/12
Cobalt	Soil	12	12	1.6 to 6.9	8.64	0/12	0/12
Copper	Soil	12	11	[4.8] to 9.8	14.7	0/12	0/12
Iron	Soil	12	12	3790 to 16300	21500	0/12	0/12
Lead	Soil	12	12	4.4 to 21.8	22.3	0/12	0/12
Magnesium	Soil	12	12	849 to 2940	4610	0/12	0/12
Manganese	Soil	12	12	253 to 556	671	0/12	0/12
Mercury	Soil	12	1	[0.0001] to 0.11	0.1	1/12	0/12
Nickel	Soil	12	12	2.5 to 9.3	15.4	0/12	0/12
Potassium	Soil	12	12	622 to 2780	3460	0/12	0/12
Selenium	Soil	12	0	[0.72 to 0.76]	1.52	0/12	0/12
Silver	Soil	12	1	[0.16 to 0.34]	1	0/12	0/12
Sodium	Soil	12	12	62.1 to 238	915	0/12	0/12
Thallium	Soil	12	1	[1.2] to 1.3	0.73	1/12	11/12
Uranium	Soil	12	12	1.59 to 3.37	5.4	0/12	0/12
Vanadium	Soil	12	12	8.7 to 27.7	39.6	0/12	0/12
Zinc	Soil	12	12	16.6 to 38	48.8	0/12	0/12

<sup>a</sup> BVs were obtained from LANL (1998, 59730.2).

<sup>b</sup> Values in brackets indicate nondetects.

**Table 2.2-3**  
**Samples with Inorganic Chemicals Above BVs at AOC 49-008(b)**

Analyte	Location ID	Sample ID	Depth (ft)	Media	BV (mg/kg)	Sample Concentration (mg/kg)
Mercury	49-06066	0549-95-0306	0-0.5	Soil	0.1	0.11
Thallium	49-06067	0549-95-0308	0-0.5	Soil	0.73	1.3

### 2.2.3.2 Radionuclide Comparison with Background/Fallout Concentrations

Table 2.2-4 presents the frequency of detected concentrations above background or fallout values for radionuclides. Because no radionuclides were detected above soil background or fallout values, no radionuclide COPCs were identified at this AOC.

**Table 2.2-4**  
**Frequency of Detected Radionuclides Above Background/Fallout Values<sup>a</sup> at AOC 49-008(b)**

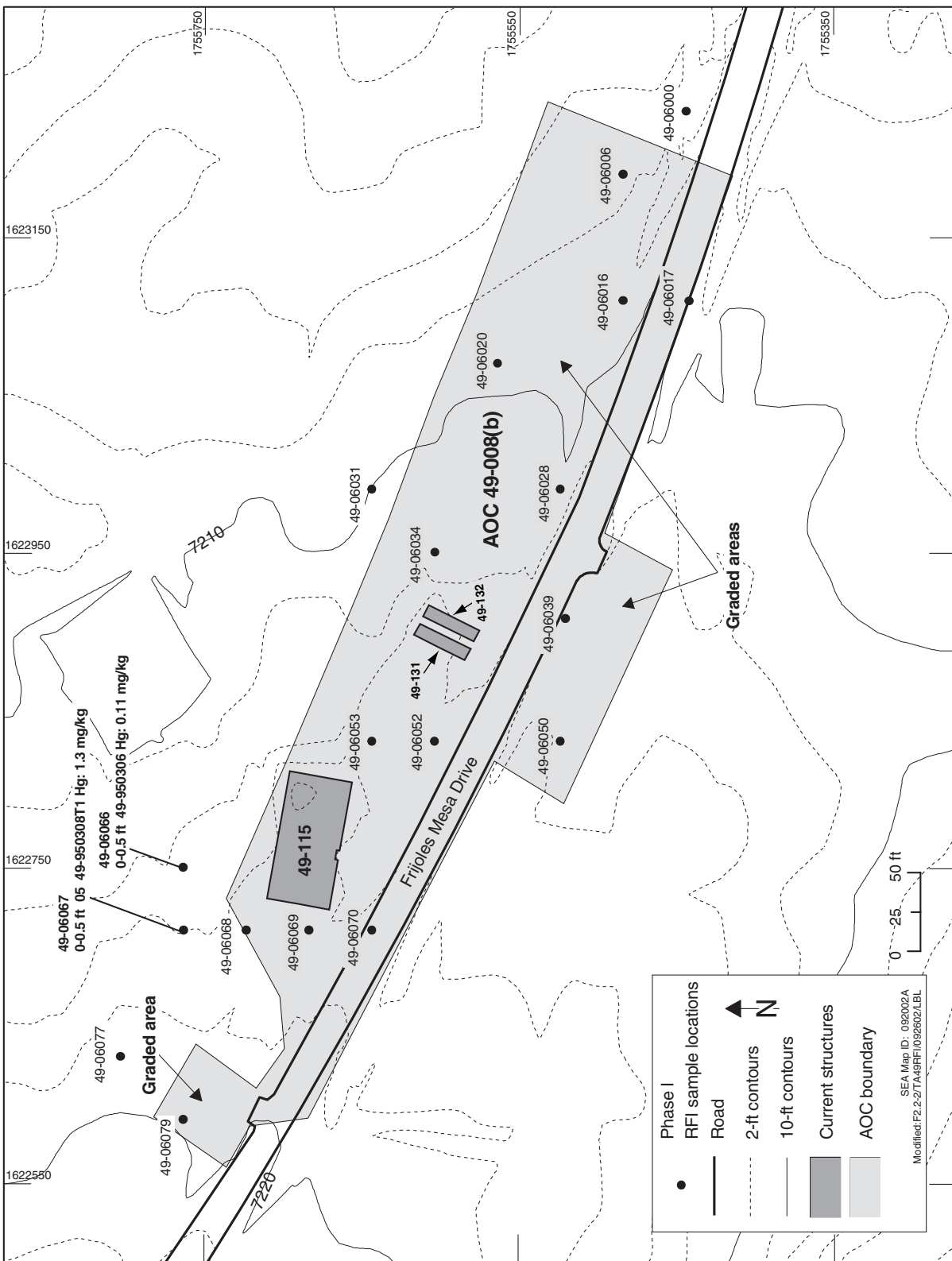
Analyte	Media	Number of Analyses	Number of Detects	Concentration Range (pCi/g)	Background/Fallout Values (pCi/g)	Frequency of Detects Above Background/Fallout Values
Americium-241	Soil	21	0	[-0.133 to 0.126]	0.013	0/21
Cesium-137	Soil	21	15	[-0.026] to 1.01	1.65	0/21
Cobalt-60	Soil	21	0	[-0.026 to 0.044]	NA	0/21
Europium-152	Soil	21	0	[-0.007 to 0.22]	NA	0/21
Plutonium-238	Soil	12	9	[-0.013] to 0.016	0.023	0/12
Plutonium-239	Soil	12	7	[0.002] to 0.034	0.054	0/12
Ruthenium-106	Soil	21	0	[-0.355 to 0.2]	NA	0/21
Sodium-22	Soil	21	0	[-0.024 to 0.033]	NA	0/21

<sup>a</sup> Background/fallout values obtained from LANL (1998, 59730.2).

### 2.2.4 Revised Site Conceptual Model

Although no documented releases are recorded for AOC 49-008(b), residual contamination is present. Mercury was detected at one location and thallium was detected at another; both were above their respective soil background levels, indicating that a release may have occurred. Additionally, detection limits for thallium were above the soil BV for the remaining eleven samples. The presence of thallium and mercury in soil above BVs may be associated with the possible operation of a small lead-casting shop and/or the storage of metal supplies in the area. The exact location of these activities within Area 6 East is unknown. Because the detected concentrations of mercury and thallium are relatively close to soil BVs and no other inorganic compounds were detected, the presence of mercury and thallium is most likely attributable to the storage and handling of metal construction supplies in the area.

Based on the small amounts of thallium and mercury in the surface soils at AOC 49-008(b), off-site transport via surface runoff is the primary migration pathway and agrees with the preliminary conceptual model. The potential exposure pathways identified in the preliminary conceptual model are also accurate. Therefore, no revisions to the conceptual model are necessary.



**Figure 2.2-2. Sample locations with inorganic chemicals detected above background concentrations in soil at AOC 49-008(b)**

### 2.2.4.1 Nature and Extent of Contamination

The storage and handling of metal materials, the possible operation of a small lead-casting shop, and the detection of mercury and thallium at separate sample locations at AOC 49-008(b) indicate that the nature of the residual contamination is limited to small quantities of inorganic compounds in surface soils. The extent of the contamination is limited and isolated as defined by the sampling grid and the absence of any other contaminants. Because of the limited area of elevated concentrations of mercury and thallium, and the similarity of the detected concentrations of COPCs to background, further sampling for extent is not warranted.

### 2.2.4.2 Environmental Fate

The physiochemical properties of detected inorganic chemicals cause them to bind to soil and move via transport of soil particles by water, as opposed to moving as dissolved chemicals in water or moving in air. Mercury and thallium are relatively stable and have affinities for soil particles, particularly soils with high organic content. Because of the low potential for erosion at this site, migration via surface runoff is limited.

## 2.3 Screening Assessments

### 2.3.1 Human Health

The screening assessment is a comparison of COPC concentrations with screening action levels (SALs). SALs for non-radiological COPCs were calculated based on the methodology provided in Appendix C of the IWP (LANL 1998, 62060) and in "Human Health Risk-Based Screening Methodology" (LANL 2002, 72639.1). The methodology is based on guidance from the New Mexico Environment Department (NMED) (NMED 2000, 68554) and from EPA Region 6 (EPA 2001, 71466.1). The SALs used in the screening evaluation reflect a residential exposure scenario, assuming exposure for 24 hours per day for 350 days per year. The SAL comparison is presented separately for noncarcinogenic chemicals (Table 2.3-1); no chemical carcinogens or radionuclides were detected above background/fallout values. SALs for noncarcinogens are based on a hazard quotient (HQ) of 1.0.

**Table 2.3-1**  
**Comparison of Noncarcinogenic COPCs with SALs at AOC 49-008(b)**

Analyte	Sample ID	Location ID	Depth (ft)	Maximum Value (mg/kg)	SAL (mg/kg)
Mercury	0549-95-0306	49-06066	0–0.5	0.11	23
Thallium	0549-95-0308	49-06067	0–0.5	1.3	6.1

All concentrations of COPCs were less than their respective SALs. Maximum HQs were less than 1.0, and the hazard index (HI), which is the sum of HQs, was less than 1.0. Thus, concentrations of COPCs are below the NMED target level of an HI of 1.0 and there is no potential unacceptable risk to human health at this site (NMED 2000, 68554).

### 2.3.2 Ecological

The purpose of an ecological screening evaluation is to identify chemicals of potential ecological concern (COPECs) for the site. The evaluation involves the calculation of HQs for all COPCs and all appropriate screening receptors by comparing the maximum sample concentrations to the final (minimum) ecological screening levels (ESLs) (LANL 1999, 64783). ESLs were obtained from the Laboratory's ECORISK

database version 1.4 (LANL 2002, 72802.1). An HQ is the ratio of the maximum COPC concentration to the minimum ESL for each chemical. The HI is a sum of HQs, and an HQ or HI greater than 1.0 is considered an indication of potential adverse effects. COPCs that result in HQs greater than 0.3 are retained as COPECs. Results of this comparison are presented in Table 2.3-2.

**Table 2.3-2**  
**Final ESL Comparison for AOC 49-008(b)**

COPC	Maximum Value (mg/kg)	ESL (mg/kg)	Receptors	HQ (unitless)
Mercury	0.11	0.05	Earthworm	2.2
Thallium	1.3	0.1	Plant	13

Based on the ESL comparison, mercury and thallium are retained as COPECs and were evaluated further by calculating the HQs for each COPEC/receptor combination, in addition to the HI for each receptor. As shown in Table 2.3-3, HI values for the terrestrial receptors range from 0.003 for the kestrel to 13 for the plant. The HI was less than or equivalent to 1.0 for the fox, kestrel, robin, cottontail, and shrew, and slightly greater than 1.0 for the deer mouse and soil invertebrate (i.e., earthworm) (1.9 and 2.2, respectively).

**Table 2.3-3**  
**HI Summary for Terrestrial Receptors**

Analyte	Plant	Invertebrate	American Robin (insectivore)	American Robin (omnivore)	American Robin (herbivore)	American Kestrel (top carnivore)	American Kestrel (intermediate carnivore)	Desert Cottontail	Deer Mouse	Vagrant Shrew	Fox
Mercury	0.003	2.2	0.03	0.02	0.01	0.002	0.003	0.00005	0.0003	0.0006	0.00003
Thallium	13	— <sup>a</sup>	—	—	—	—	—	0.05	1.9	1.1	0.05
<b>HI</b>	<b>13</b>	<b>2.2</b>	<b>0.03</b>	<b>0.02</b>	<b>0.01</b>	<b>0.002</b>	<b>0.003</b>	<b>0.05</b>	<b>1.9</b>	<b>1.1</b>	<b>0.05</b>

<sup>a</sup> A dash indicates that an ESL for the chemical/receptor combination is not available.

Based on the infrequent nature of the detected concentrations, and the similarity of the detected concentrations to BVs (BV = 0.1 mg/kg and 0.73 mg/kg for mercury and thallium, respectively), the identified COPECs pose no potential risk to either the deer mouse or the earthworm. Concentrations also present no potential risk to plants because a healthy plant community consisting of grasses and forbs, which are typical of disturbed areas, inhabits the area in and around the site.

### 2.3.3 Surface Water

RRES-R has developed a procedure for assessing sediment transport and erosion concerns at individual sites. The procedure provides a basis for prioritizing and scheduling actions to control the erosion of potentially contaminated soils at specific sites. The procedure is a two-part evaluation: Part A is a compilation of existing analytical data, site maps, and knowledge-of-process information; Part B is an assessment of the erosion/sediment transport potential. Erosion potential is numerically rated from 1 to 100 using a matrix system. Sites that score below 40 have low erosion potential, those that score from 40 to 60 have medium erosion potential, and those that score above 60 have high erosion potential.

A surface water assessment for AOC 49-008(b) was conducted on August 24, 2001 (see Appendix C of this document), after RFI activities had been completed. The assessment resulted in an erosion matrix score of 3.6, which indicates a low potential for erosion. The assessment found no debris in any nearby

watercourse. There are no wetlands or springs in the vicinity of AOC 49-008(b). The results of the surface water assessment indicated little potential for contaminant transport via surface water.

## 2.4 Conclusions and Recommendations

Other than low concentrations of mercury and thallium, no COPCs (including no radionuclides) were detected at AOC 49-008(b). The residual concentrations of mercury and thallium are relatively close to soil background levels. Human health and ecological screening assessments demonstrated that the residual concentrations of mercury and thallium at AOC 49-008(b) pose no unacceptable potential risk to human or ecological receptors under current and future land use.

Based on the results of the RFI, AOC 49-008(b) is recommended for NFA under NFA criterion 5. This criterion states that the site was characterized in accordance with applicable state and/or federal regulations, and that the available data indicate that chemicals of concern are either not present or are present at concentrations that pose no potential unacceptable level of human health or ecological risk under current and projected future land use (NMED 1998, 57897).

## 3.0 REFERENCES

*The following list includes all references cited in this document. The parenthetical information that follows each reference provides the author, publication date, and the environmental restoration record identification (ER ID) number. This information also is included in the citations in the text and can be used to locate the documents.*

*ER ID numbers are assigned by the Laboratory's RRES-R Program to track records associated with the program. These numbers can be used to locate copies of the actual documents at the RRES-R Program's Records Processing Facility and, where applicable, within the RRES-R Program reference library titled Reference Set for Material Disposal Area TA-49.*

*Copies of the reference library are maintained at the New Mexico Environment Department Hazardous and Radioactive Materials Bureau; the Department of Energy Office of Los Alamos Site Operations; EPA Region 6; and the RRES-R Material Disposal Area Focus Area. This library is a living document that was developed to ensure that the administrative authority (AA) has all the necessary material to review the decisions and actions proposed in this document. However, documents previously submitted to the AA are not included in the reference library.*

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# **Appendix A**

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## *Ecological Scoping Checklist*



## **Appendix B**

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*Analytical Results for AOC 49-008(b)*



**Table B-1**  
**Inorganic Chemical Analytical Data for Soils at AOC 49-008(b)**

Location ID	Sample ID	Depth (ft)	Media	Analyte	Result (mg/kg)	Qualifier
49-06000	0549-95-0294	0–0.5	Soil	Aluminum	21000.00	None
49-06000	0549-95-0294	0–0.5	Soil	Antimony	0.69	U <sup>a</sup>
49-06000	0549-95-0294	0–0.5	Soil	Arsenic	3.20	U
49-06000	0549-95-0294	0–0.5	Soil	Barium	153.00	None
49-06000	0549-95-0294	0–0.5	Soil	Beryllium	1.10	None
49-06000	0549-95-0294	0–0.5	Soil	Cadmium	0.40	J <sup>b</sup>
49-06000	0549-95-0294	0–0.5	Soil	Calcium	2810.00	None
49-06000	0549-95-0294	0–0.5	Soil	Chromium (total)	13.10	None
49-06000	0549-95-0294	0–0.5	Soil	Cobalt	6.90	J
49-06000	0549-95-0294	0–0.5	Soil	Copper	9.40	None
49-06000	0549-95-0294	0–0.5	Soil	Iron	16300.00	None
49-06000	0549-95-0294	0–0.5	Soil	Lead	15.10	None
49-06000	0549-95-0294	0–0.5	Soil	Magnesium	2940.00	None
49-06000	0549-95-0294	0–0.5	Soil	Manganese	403.00	J- <sup>c</sup>
49-06000	0549-95-0294	0–0.5	Soil	Mercury	0.00	U
49-06000	0549-95-0294	0–0.5	Soil	Nickel	9.30	None
49-06000	0549-95-0294	0–0.5	Soil	Potassium	2680.00	None
49-06000	0549-95-0294	0–0.5	Soil	Selenium	0.75	U
49-06000	0549-95-0294	0–0.5	Soil	Silver	0.29	U
49-06000	0549-95-0294	0–0.5	Soil	Sodium	175.00	J
49-06000	0549-95-0294	0–0.5	Soil	Thallium	1.30	U
49-06000	0549-95-0294	0–0.5	Soil	Uranium	1.95	None
49-06000	0549-95-0294	0–0.5	Soil	Vanadium	27.70	None
49-06000	0549-95-0294	0–0.5	Soil	Zinc	33.70	None
49-06017	0549-95-0297	0–0.5	Soil	Aluminum	11300.00	None
49-06017	0549-95-0297	0–0.5	Soil	Antimony	0.66	U
49-06017	0549-95-0297	0–0.5	Soil	Arsenic	4.30	U
49-06017	0549-95-0297	0–0.5	Soil	Barium	132.00	None
49-06017	0549-95-0297	0–0.5	Soil	Beryllium	0.56	J
49-06017	0549-95-0297	0–0.5	Soil	Cadmium	0.34	J
49-06017	0549-95-0297	0–0.5	Soil	Calcium	2770.00	None
49-06017	0549-95-0297	0–0.5	Soil	Chromium (total)	9.50	None
49-06017	0549-95-0297	0–0.5	Soil	Cobalt	5.50	J
49-06017	0549-95-0297	0–0.5	Soil	Copper	9.80	None
49-06017	0549-95-0297	0–0.5	Soil	Iron	12300.00	None
49-06017	0549-95-0297	0–0.5	Soil	Lead	18.20	None
49-06017	0549-95-0297	0–0.5	Soil	Magnesium	2000.00	None

Table B-1 (continued)

Location ID	Sample ID	Depth (ft)	Media	Analyte	Result (mg/kg)	Qualifier
49-06017	0549-95-0297	0–0.5	Soil	Manganese	388.00	J-
49-06017	0549-95-0297	0–0.5	Soil	Nickel	7.40	J
49-06017	0549-95-0297	0–0.5	Soil	Potassium	2140.00	None
49-06017	0549-95-0297	0–0.5	Soil	Selenium	0.72	U
49-06017	0549-95-0297	0–0.5	Soil	Silver	0.23	U
49-06017	0549-95-0297	0–0.5	Soil	Sodium	118.00	J
49-06017	0549-95-0297	0–0.5	Soil	Thallium	1.20	U
49-06017	0549-95-0297	0–0.5	Soil	Uranium	1.93	None
49-06017	0549-95-0297	0–0.5	Soil	Vanadium	24.30	None
49-06017	0549-95-0297	0–0.5	Soil	Zinc	36.70	None
49-06031	0549-95-0300	0–0.5	Soil	Aluminum	4920.00	None
49-06031	0549-95-0300	0–0.5	Soil	Antimony	0.68	U
49-06031	0549-95-0300	0–0.5	Soil	Arsenic	1.60	U
49-06031	0549-95-0300	0–0.5	Soil	Barium	83.80	None
49-06031	0549-95-0300	0–0.5	Soil	Beryllium	0.25	U
49-06031	0549-95-0300	0–0.5	Soil	Cadmium	0.24	U
49-06031	0549-95-0300	0–0.5	Soil	Calcium	2390.00	None
49-06031	0549-95-0300	0–0.5	Soil	Chromium (total)	5.60	None
49-06031	0549-95-0300	0–0.5	Soil	Cobalt	2.90	J
49-06031	0549-95-0300	0–0.5	Soil	Copper	6.30	None
49-06031	0549-95-0300	0–0.5	Soil	Iron	6250.00	None
49-06031	0549-95-0300	0–0.5	Soil	Lead	9.00	None
49-06031	0549-95-0300	0–0.5	Soil	Magnesium	1060.00	None
49-06031	0549-95-0300	0–0.5	Soil	Manganese	253.00	J-
49-06031	0549-95-0300	0–0.5	Soil	Mercury	0.10	U
49-06031	0549-95-0300	0–0.5	Soil	Nickel	3.20	J
49-06031	0549-95-0300	0–0.5	Soil	Potassium	1350.00	None
49-06031	0549-95-0300	0–0.5	Soil	Selenium	0.74	U
49-06031	0549-95-0300	0–0.5	Soil	Silver	0.17	U
49-06031	0549-95-0300	0–0.5	Soil	Sodium	62.10	J
49-06031	0549-95-0300	0–0.5	Soil	Thallium	1.20	U
49-06031	0549-95-0300	0–0.5	Soil	Uranium	2.24	None
49-06031	0549-95-0300	0–0.5	Soil	Vanadium	12.60	None
49-06031	0549-95-0300	0–0.5	Soil	Zinc	22.90	None
49-06034	0549-95-0301	0–0.5	Soil	Aluminum	2160.00	None
49-06034	0549-95-0301	0–0.5	Soil	Antimony	0.67	U
49-06034	0549-95-0301	0–0.5	Soil	Arsenic	1.10	U
49-06034	0549-95-0301	0–0.5	Soil	Barium	208.00	None

Table B-1 (continued)

Location ID	Sample ID	Depth (ft)	Media	Analyte	Result (mg/kg)	Qualifier
49-06034	0549-95-0301	0–0.5	Soil	Beryllium	0.08	U
49-06034	0549-95-0301	0–0.5	Soil	Cadmium	0.17	U
49-06034	0549-95-0301	0–0.5	Soil	Calcium	1950.00	None
49-06034	0549-95-0301	0–0.5	Soil	Chromium (total)	5.20	None
49-06034	0549-95-0301	0–0.5	Soil	Cobalt	1.60	J
49-06034	0549-95-0301	0–0.5	Soil	Copper	4.80	U
49-06034	0549-95-0301	0–0.5	Soil	Iron	3790.00	None
49-06034	0549-95-0301	0–0.5	Soil	Lead	6.20	None
49-06034	0549-95-0301	0–0.5	Soil	Magnesium	849.00	J
49-06034	0549-95-0301	0–0.5	Soil	Manganese	556.00	J-
49-06034	0549-95-0301	0–0.5	Soil	Mercury	0.09	U
49-06034	0549-95-0301	0–0.5	Soil	Nickel	2.50	J
49-06034	0549-95-0301	0–0.5	Soil	Potassium	622.00	J
49-06034	0549-95-0301	0–0.5	Soil	Selenium	0.73	U
49-06034	0549-95-0301	0–0.5	Soil	Silver	0.16	U
49-06034	0549-95-0301	0–0.5	Soil	Sodium	101.00	J
49-06034	0549-95-0301	0–0.5	Soil	Thallium	1.20	U
49-06034	0549-95-0301	0–0.5	Soil	Uranium	1.98	None
49-06034	0549-95-0301	0–0.5	Soil	Vanadium	8.70	J
49-06034	0549-95-0301	0–0.5	Soil	Zinc	16.60	None
49-06039	0549-95-0302	0–0.5	Soil	Aluminum	4470.00	None
49-06039	0549-95-0302	0–0.5	Soil	Antimony	0.69	U
49-06039	0549-95-0302	0–0.5	Soil	Arsenic	2.50	U
49-06039	0549-95-0302	0–0.5	Soil	Barium	73.20	None
49-06039	0549-95-0302	0–0.5	Soil	Beryllium	0.26	J
49-06039	0549-95-0302	0–0.5	Soil	Cadmium	0.22	U
49-06039	0549-95-0302	0–0.5	Soil	Calcium	1780.00	None
49-06039	0549-95-0302	0–0.5	Soil	Chromium (total)	4.00	None
49-06039	0549-95-0302	0–0.5	Soil	Cobalt	2.50	J
49-06039	0549-95-0302	0–0.5	Soil	Copper	7.40	None
49-06039	0549-95-0302	0–0.5	Soil	Iron	6260.00	None
49-06039	0549-95-0302	0–0.5	Soil	Lead	14.40	None
49-06039	0549-95-0302	0–0.5	Soil	Magnesium	958.00	J
49-06039	0549-95-0302	0–0.5	Soil	Manganese	253.00	J-
49-06039	0549-95-0302	0–0.5	Soil	Mercury	0.10	U
49-06039	0549-95-0302	0–0.5	Soil	Nickel	3.70	J
49-06039	0549-95-0302	0–0.5	Soil	Potassium	756.00	J
49-06039	0549-95-0302	0–0.5	Soil	Selenium	0.75	U

Table B-1 (continued)

Location ID	Sample ID	Depth (ft)	Media	Analyte	Result (mg/kg)	Qualifier
49-06039	0549-95-0302	0–0.5	Soil	Silver	0.22	U
49-06039	0549-95-0302	0–0.5	Soil	Sodium	128.00	J
49-06039	0549-95-0302	0–0.5	Soil	Thallium	1.30	U
49-06039	0549-95-0302	0–0.5	Soil	Uranium	1.82	None
49-06039	0549-95-0302	0–0.5	Soil	Vanadium	11.50	None
49-06039	0549-95-0302	0–0.5	Soil	Zinc	26.30	None
49-06053	0549-95-0305	0–0.5	Soil	Aluminum	4100.00	None
49-06053	0549-95-0305	0–0.5	Soil	Antimony	0.69	U
49-06053	0549-95-0305	0–0.5	Soil	Arsenic	0.97	U
49-06053	0549-95-0305	0–0.5	Soil	Barium	167.00	None
49-06053	0549-95-0305	0–0.5	Soil	Beryllium	0.12	U
49-06053	0549-95-0305	0–0.5	Soil	Cadmium	0.22	U
49-06053	0549-95-0305	0–0.5	Soil	Calcium	2670.00	None
49-06053	0549-95-0305	0–0.5	Soil	Chromium (total)	4.80	None
49-06053	0549-95-0305	0–0.5	Soil	Cobalt	3.20	J
49-06053	0549-95-0305	0–0.5	Soil	Copper	6.70	None
49-06053	0549-95-0305	0–0.5	Soil	Iron	6880.00	None
49-06053	0549-95-0305	0–0.5	Soil	Lead	4.40	None
49-06053	0549-95-0305	0–0.5	Soil	Magnesium	1810.00	None
49-06053	0549-95-0305	0–0.5	Soil	Manganese	376.00	J-
49-06053	0549-95-0305	0–0.5	Soil	Mercury	0.09	U
49-06053	0549-95-0305	0–0.5	Soil	Nickel	5.10	J
49-06053	0549-95-0305	0–0.5	Soil	Potassium	853.00	J
49-06053	0549-95-0305	0–0.5	Soil	Selenium	0.75	U
49-06053	0549-95-0305	0–0.5	Soil	Silver	0.17	U
49-06053	0549-95-0305	0–0.5	Soil	Sodium	130.00	J
49-06053	0549-95-0305	0–0.5	Soil	Thallium	1.30	U
49-06053	0549-95-0305	0–0.5	Soil	Uranium	1.59	None
49-06053	0549-95-0305	0–0.5	Soil	Vanadium	19.70	None
49-06053	0549-95-0305	0–0.5	Soil	Zinc	16.90	None
49-06066	0549-95-0306	0–0.5	Soil	Aluminum	12100.00	None
49-06066	0549-95-0306	0–0.5	Soil	Antimony	0.68	U
49-06066	0549-95-0306	0–0.5	Soil	Arsenic	3.20	U
49-06066	0549-95-0306	0–0.5	Soil	Barium	128.00	None
49-06066	0549-95-0306	0–0.5	Soil	Beryllium	0.69	J
49-06066	0549-95-0306	0–0.5	Soil	Cadmium	0.40	J
49-06066	0549-95-0306	0–0.5	Soil	Calcium	2520.00	None
49-06066	0549-95-0306	0–0.5	Soil	Chromium (total)	8.80	None

Table B-1 (continued)

Location ID	Sample ID	Depth (ft)	Media	Analyte	Result (mg/kg)	Qualifier
49-06066	0549-95-0306	0–0.5	Soil	Cobalt	4.70	J
49-06066	0549-95-0306	0–0.5	Soil	Copper	7.90	None
49-06066	0549-95-0306	0–0.5	Soil	Iron	10800.00	None
49-06066	0549-95-0306	0–0.5	Soil	Lead	17.40	None
49-06066	0549-95-0306	0–0.5	Soil	Magnesium	2220.00	None
49-06066	0549-95-0306	0–0.5	Soil	Manganese	331.00	J-
49-06066	0549-95-0306	0–0.5	Soil	Mercury	0.11	None
49-06066	0549-95-0306	0–0.5	Soil	Nickel	7.00	J
49-06066	0549-95-0306	0–0.5	Soil	Potassium	2500.00	None
49-06066	0549-95-0306	0–0.5	Soil	Selenium	0.74	U
49-06066	0549-95-0306	0–0.5	Soil	Silver	0.21	U
49-06066	0549-95-0306	0–0.5	Soil	Sodium	148.00	J
49-06066	0549-95-0306	0–0.5	Soil	Thallium	1.20	U
49-06066	0549-95-0306	0–0.5	Soil	Uranium	1.95	None
49-06066	0549-95-0306	0–0.5	Soil	Vanadium	18.00	None
49-06066	0549-95-0306	0–0.5	Soil	Zinc	34.40	None
49-06066	0549-95-0307	0–0.5	Soil	Aluminum	14000.00	None
49-06066	0549-95-0307	0–0.5	Soil	Antimony	0.68	U
49-06066	0549-95-0307	0–0.5	Soil	Arsenic	3.70	U
49-06066	0549-95-0307	0–0.5	Soil	Barium	123.00	None
49-06066	0549-95-0307	0–0.5	Soil	Beryllium	0.72	J
49-06066	0549-95-0307	0–0.5	Soil	Cadmium	0.51	J
49-06066	0549-95-0307	0–0.5	Soil	Calcium	2540.00	None
49-06066	0549-95-0307	0–0.5	Soil	Chromium (total)	11.40	None
49-06066	0549-95-0307	0–0.5	Soil	Cobalt	4.60	J
49-06066	0549-95-0307	0–0.5	Soil	Copper	8.30	None
49-06066	0549-95-0307	0–0.5	Soil	Iron	11900.00	None
49-06066	0549-95-0307	0–0.5	Soil	Lead	21.80	None
49-06066	0549-95-0307	0–0.5	Soil	Magnesium	2440.00	None
49-06066	0549-95-0307	0–0.5	Soil	Manganese	311.00	J-
49-06066	0549-95-0307	0–0.5	Soil	Mercury	0.10	U
49-06066	0549-95-0307	0–0.5	Soil	Nickel	7.50	J
49-06066	0549-95-0307	0–0.5	Soil	Potassium	2780.00	None
49-06066	0549-95-0307	0–0.5	Soil	Selenium	0.74	U
49-06066	0549-95-0307	0–0.5	Soil	Silver	0.22	U
49-06066	0549-95-0307	0–0.5	Soil	Sodium	238.00	J
49-06066	0549-95-0307	0–0.5	Soil	Thallium	1.20	U
49-06066	0549-95-0307	0–0.5	Soil	Uranium	1.91	None

Table B-1 (continued)

Location ID	Sample ID	Depth (ft)	Media	Analyte	Result (mg/kg)	Qualifier
49-06066	0549-95-0307	0–0.5	Soil	Vanadium	19.20	None
49-06066	0549-95-0307	0–0.5	Soil	Zinc	38.00	None
49-06067	0549-95-0308	0–0.5	Soil	Aluminum	12400.00	None
49-06067	0549-95-0308	0–0.5	Soil	Antimony	0.66	U
49-06067	0549-95-0308	0–0.5	Soil	Arsenic	3.70	U
49-06067	0549-95-0308	0–0.5	Soil	Barium	139.00	None
49-06067	0549-95-0308	0–0.5	Soil	Beryllium	0.63	J
49-06067	0549-95-0308	0–0.5	Soil	Cadmium	0.39	J
49-06067	0549-95-0308	0–0.5	Soil	Calcium	2560.00	None
49-06067	0549-95-0308	0–0.5	Soil	Chromium (total)	9.40	None
49-06067	0549-95-0308	0–0.5	Soil	Cobalt	5.00	J
49-06067	0549-95-0308	0–0.5	Soil	Copper	7.80	None
49-06067	0549-95-0308	0–0.5	Soil	Iron	11500.00	None
49-06067	0549-95-0308	0–0.5	Soil	Lead	16.60	None
49-06067	0549-95-0308	0–0.5	Soil	Magnesium	2150.00	None
49-06067	0549-95-0308	0–0.5	Soil	Manganese	344.00	J-
49-06067	0549-95-0308	0–0.5	Soil	Mercury	0.10	U
49-06067	0549-95-0308	0–0.5	Soil	Nickel	7.00	J
49-06067	0549-95-0308	0–0.5	Soil	Potassium	2470.00	None
49-06067	0549-95-0308	0–0.5	Soil	Selenium	0.72	U
49-06067	0549-95-0308	0–0.5	Soil	Silver	0.34	U
49-06067	0549-95-0308	0–0.5	Soil	Sodium	135.00	J
49-06067	0549-95-0308	0–0.5	Soil	Thallium	1.30	J
49-06067	0549-95-0308	0–0.5	Soil	Uranium	3.37	None
49-06067	0549-95-0308	0–0.5	Soil	Vanadium	20.20	None
49-06067	0549-95-0308	0–0.5	Soil	Zinc	35.70	None
49-06068	0549-95-0309	0–0.5	Soil	Aluminum	9750.00	None
49-06068	0549-95-0309	0–0.5	Soil	Antimony	0.66	U
49-06068	0549-95-0309	0–0.5	Soil	Arsenic	3.70	U
49-06068	0549-95-0309	0–0.5	Soil	Barium	137.00	None
49-06068	0549-95-0309	0–0.5	Soil	Beryllium	0.58	J
49-06068	0549-95-0309	0–0.5	Soil	Cadmium	0.34	J
49-06068	0549-95-0309	0–0.5	Soil	Calcium	2040.00	None
49-06068	0549-95-0309	0–0.5	Soil	Chromium (total)	7.60	None
49-06068	0549-95-0309	0–0.5	Soil	Cobalt	6.20	J
49-06068	0549-95-0309	0–0.5	Soil	Copper	5.90	None
49-06068	0549-95-0309	0–0.5	Soil	Iron	11000.00	None
49-06068	0549-95-0309	0–0.5	Soil	Lead	13.90	None

Table B-1 (continued)

Location ID	Sample ID	Depth (ft)	Media	Analyte	Result (mg/kg)	Qualifier
49-06068	0549-95-0309	0–0.5	Soil	Magnesium	1740.00	None
49-06068	0549-95-0309	0–0.5	Soil	Manganese	426.00	J-
49-06068	0549-95-0309	0–0.5	Soil	Mercury	0.10	U
49-06068	0549-95-0309	0–0.5	Soil	Nickel	6.50	J
49-06068	0549-95-0309	0–0.5	Soil	Potassium	2040.00	None
49-06068	0549-95-0309	0–0.5	Soil	Selenium	0.72	U
49-06068	0549-95-0309	0–0.5	Soil	Silver	0.19	U
49-06068	0549-95-0309	0–0.5	Soil	Sodium	83.70	J
49-06068	0549-95-0309	0–0.5	Soil	Thallium	1.20	U
49-06068	0549-95-0309	0–0.5	Soil	Uranium	2.70	None
49-06068	0549-95-0309	0–0.5	Soil	Vanadium	21.40	None
49-06068	0549-95-0309	0–0.5	Soil	Zinc	24.70	None
49-06069	0549-95-0310	0–0.5	Soil	Aluminum	12700.00	None
49-06069	0549-95-0310	0–0.5	Soil	Antimony	0.70	U
49-06069	0549-95-0310	0–0.5	Soil	Arsenic	3.30	U
49-06069	0549-95-0310	0–0.5	Soil	Barium	137.00	None
49-06069	0549-95-0310	0–0.5	Soil	Beryllium	0.59	J
49-06069	0549-95-0310	0–0.5	Soil	Cadmium	0.51	J
49-06069	0549-95-0310	0–0.5	Soil	Calcium	2120.00	None
49-06069	0549-95-0310	0–0.5	Soil	Chromium (total)	7.70	None
49-06069	0549-95-0310	0–0.5	Soil	Cobalt	4.40	J
49-06069	0549-95-0310	0–0.5	Soil	Copper	8.30	None
49-06069	0549-95-0310	0–0.5	Soil	Iron	10400.00	None
49-06069	0549-95-0310	0–0.5	Soil	Lead	13.00	None
49-06069	0549-95-0310	0–0.5	Soil	Magnesium	1780.00	None
49-06069	0549-95-0310	0–0.5	Soil	Manganese	354.00	J-
49-06069	0549-95-0310	0–0.5	Soil	Mercury	0.10	U
49-06069	0549-95-0310	0–0.5	Soil	Nickel	6.40	J
49-06069	0549-95-0310	0–0.5	Soil	Potassium	2140.00	None
49-06069	0549-95-0310	0–0.5	Soil	Selenium	0.76	U
49-06069	0549-95-0310	0–0.5	Soil	Silver	0.26	J
49-06069	0549-95-0310	0–0.5	Soil	Sodium	180.00	J
49-06069	0549-95-0310	0–0.5	Soil	Thallium	1.30	U
49-06069	0549-95-0310	0–0.5	Soil	Uranium	2.02	None
49-06069	0549-95-0310	0–0.5	Soil	Vanadium	17.30	None
49-06069	0549-95-0310	0–0.5	Soil	Zinc	31.70	None
49-06069	0549-95-0311	0–0.5	Soil	Aluminum	7690.00	None
49-06069	0549-95-0311	0–0.5	Soil	Antimony	0.69	U

Table B-1 (continued)

Location ID	Sample ID	Depth (ft)	Media	Analyte	Result (mg/kg)	Qualifier
49-06069	0549-95-0311	0–0.5	Soil	Arsenic	2.30	U
49-06069	0549-95-0311	0–0.5	Soil	Barium	120.00	None
49-06069	0549-95-0311	0–0.5	Soil	Beryllium	0.54	J
49-06069	0549-95-0311	0–0.5	Soil	Cadmium	0.46	J
49-06069	0549-95-0311	0–0.5	Soil	Calcium	2040.00	None
49-06069	0549-95-0311	0–0.5	Soil	Chromium (total)	5.50	None
49-06069	0549-95-0311	0–0.5	Soil	Cobalt	3.90	J
49-06069	0549-95-0311	0–0.5	Soil	Copper	7.50	None
49-06069	0549-95-0311	0–0.5	Soil	Iron	7560.00	None
49-06069	0549-95-0311	0–0.5	Soil	Lead	12.60	None
49-06069	0549-95-0311	0–0.5	Soil	Magnesium	1400.00	None
49-06069	0549-95-0311	0–0.5	Soil	Manganese	313.00	J-
49-06069	0549-95-0311	0–0.5	Soil	Mercury	0.10	U
49-06069	0549-95-0311	0–0.5	Soil	Nickel	4.90	J
49-06069	0549-95-0311	0–0.5	Soil	Potassium	1620.00	None
49-06069	0549-95-0311	0–0.5	Soil	Selenium	0.75	U
49-06069	0549-95-0311	0–0.5	Soil	Silver	0.22	U
49-06069	0549-95-0311	0–0.5	Soil	Sodium	130.00	J
49-06069	0549-95-0311	0–0.5	Soil	Thallium	1.30	U
49-06069	0549-95-0311	0–0.5	Soil	Uranium	2.30	None
49-06069	0549-95-0311	0–0.5	Soil	Vanadium	14.00	None
49-06069	0549-95-0311	0–0.5	Soil	Zinc	24.90	None

<sup>a</sup> U indicates not detected.

<sup>b</sup> J indicates the value is estimated.

<sup>c</sup> J- indicates the value is estimated and has a low bias.

**Table B-2**  
**Radionuclide Analytical Data in Soils at AOC 49-008(b)**

Location ID	Sample ID	Depth (ft)	Media	Analyte	Result (pCi/g)	Qualifier
49-06000	0549-95-0294	0–0.5	Soil	Americium-241	-0.052	U <sup>a</sup>
49-06000	0549-95-0294	0–0.5	Soil	Cesium-137	0.089	U
49-06000	0549-95-0294	0–0.5	Soil	Cobalt-60	0.016	U
49-06000	0549-95-0294	0–0.5	Soil	Europium-152	0.08	U
49-06000	0549-95-0294	0–0.5	Soil	Plutonium-238	0.014	None
49-06000	0549-95-0294	0–0.5	Soil	Plutonium-239	0.016	None
49-06000	0549-95-0294	0–0.5	Soil	Ruthenium-106	-0.061	U
49-06000	0549-95-0294	0–0.5	Soil	Sodium-22	0.007	U
49-06006	0549-95-0295	0–0.5	Soil	Americium-241	-0.029	U
49-06006	0549-95-0295	0–0.5	Soil	Cesium-137	0.225	None
49-06006	0549-95-0295	0–0.5	Soil	Cobalt-60	0.015	U
49-06006	0549-95-0295	0–0.5	Soil	Europium-152	-0.007	U
49-06006	0549-95-0295	0–0.5	Soil	Ruthenium-106	-0.039	U
49-06006	0549-95-0295	0–0.5	Soil	Sodium-22	0.018	U
49-06016	0549-95-0296	0–0.5	Soil	Americium-241	0.024	U
49-06016	0549-95-0296	0–0.5	Soil	Cesium-137	0.391	None
49-06016	0549-95-0296	0–0.5	Soil	Cobalt-60	-0.026	U
49-06016	0549-95-0296	0–0.5	Soil	Europium-152	0.092	U
49-06016	0549-95-0296	0–0.5	Soil	Ruthenium-106	0.013	U
49-06016	0549-95-0296	0–0.5	Soil	Sodium-22	-0.005	U
49-06017	0549-95-0297	0–0.5	Soil	Americium-241	-0.015	U
49-06017	0549-95-0297	0–0.5	Soil	Cesium-137	1.01	None
49-06017	0549-95-0297	0–0.5	Soil	Cobalt-60	0.011	U
49-06017	0549-95-0297	0–0.5	Soil	Europium-152	0.128	U
49-06017	0549-95-0297	0–0.5	Soil	Plutonium-238	-0.002	U
49-06017	0549-95-0297	0–0.5	Soil	Plutonium-239	0.009	U
49-06017	0549-95-0297	0–0.5	Soil	Ruthenium-106	-0.031	U
49-06017	0549-95-0297	0–0.5	Soil	Sodium-22	-0.018	U
49-06020	0549-95-0298	0–0.5	Soil	Americium-241	-0.133	U
49-06020	0549-95-0298	0–0.5	Soil	Cesium-137	0.657	None
49-06020	0549-95-0298	0–0.5	Soil	Cobalt-60	-0.023	U
49-06020	0549-95-0298	0–0.5	Soil	Europium-152	-0.007	U
49-06020	0549-95-0298	0–0.5	Soil	Ruthenium-106	-0.213	U
49-06020	0549-95-0298	0–0.5	Soil	Sodium-22	0.015	U
49-06028	0549-95-0299	0–0.5	Soil	Americium-241	-0.013	U
49-06028	0549-95-0299	0–0.5	Soil	Cesium-137	0.238	None
49-06028	0549-95-0299	0–0.5	Soil	Cobalt-60	0.002	U

Table B-2 (continued)

Location ID	Sample ID	Depth (ft)	Media	Analyte	Result (pCi/g)	Qualifier
49-06028	0549-95-0299	0–0.5	Soil	Europium-152	0.172	U
49-06028	0549-95-0299	0–0.5	Soil	Ruthenium-106	-0.004	U
49-06028	0549-95-0299	0–0.5	Soil	Sodium-22	0.033	U
49-06031	0549-95-0300	0–0.5	Soil	Americium-241	-0.005	U
49-06031	0549-95-0300	0–0.5	Soil	Cesium-137	0.399	None
49-06031	0549-95-0300	0–0.5	Soil	Cobalt-60	0.003	U
49-06031	0549-95-0300	0–0.5	Soil	Europium-152	0	U
49-06031	0549-95-0300	0–0.5	Soil	Plutonium-238	0.011	None
49-06031	0549-95-0300	0–0.5	Soil	Plutonium-239	0.034	None
49-06031	0549-95-0300	0–0.5	Soil	Ruthenium-106	-0.023	U
49-06031	0549-95-0300	0–0.5	Soil	Sodium-22	-0.018	U
49-06034	0549-95-0301	0–0.5	Soil	Americium-241	0.051	U
49-06034	0549-95-0301	0–0.5	Soil	Cesium-137	0.5	None
49-06034	0549-95-0301	0–0.5	Soil	Cobalt-60	0.014	U
49-06034	0549-95-0301	0–0.5	Soil	Europium-152	0.05	U
49-06034	0549-95-0301	0–0.5	Soil	Plutonium-238	-0.013	U
49-06034	0549-95-0301	0–0.5	Soil	Plutonium-239	0.007	U
49-06034	0549-95-0301	0–0.5	Soil	Ruthenium-106	-0.107	U
49-06034	0549-95-0301	0–0.5	Soil	Sodium-22	0.012	U
49-06039	0549-95-0302	0–0.5	Soil	Americium-241	0.126	U
49-06039	0549-95-0302	0–0.5	Soil	Cesium-137	0.764	None
49-06039	0549-95-0302	0–0.5	Soil	Cobalt-60	0.018	U
49-06039	0549-95-0302	0–0.5	Soil	Europium-152	0.027	U
49-06039	0549-95-0302	0–0.5	Soil	Plutonium-238	0.005	None
49-06039	0549-95-0302	0–0.5	Soil	Plutonium-239	0.02	None
49-06039	0549-95-0302	0–0.5	Soil	Ruthenium-106	-0.219	U
49-06039	0549-95-0302	0–0.5	Soil	Sodium-22	0.006	U
49-06050	0549-95-0303	0–0.5	Soil	Americium-241	0.064	U
49-06050	0549-95-0303	0–0.5	Soil	Cesium-137	0.705	None
49-06050	0549-95-0303	0–0.5	Soil	Cobalt-60	0.032	U
49-06050	0549-95-0303	0–0.5	Soil	Europium-152	0.081	U
49-06050	0549-95-0303	0–0.5	Soil	Ruthenium-106	-0.355	U
49-06050	0549-95-0303	0–0.5	Soil	Sodium-22	0.008	U
49-06052	0549-95-0304	0–0.5	Soil	Americium-241	-0.103	U
49-06052	0549-95-0304	0–0.5	Soil	Cesium-137	0.001	U
49-06052	0549-95-0304	0–0.5	Soil	Cobalt-60	-0.021	U
49-06052	0549-95-0304	0–0.5	Soil	Europium-152	0.047	U
49-06052	0549-95-0304	0–0.5	Soil	Ruthenium-106	0.2	U
49-06052	0549-95-0304	0–0.5	Soil	Sodium-22	0.01	U

Table B-2 (continued)

Location ID	Sample ID	Depth (ft)	Media	Analyte	Result (pCi/g)	Qualifier
49-06053	0549-95-0305	0–0.5	Soil	Americium-241	-0.019	U
49-06053	0549-95-0305	0–0.5	Soil	Cesium-137	-0.026	U
49-06053	0549-95-0305	0–0.5	Soil	Cobalt-60	0.007	U
49-06053	0549-95-0305	0–0.5	Soil	Europium-152	0.064	U
49-06053	0549-95-0305	0–0.5	Soil	Plutonium-238	-0.007	U
49-06053	0549-95-0305	0–0.5	Soil	Plutonium-239	0.002	U
49-06053	0549-95-0305	0–0.5	Soil	Ruthenium-106	0	U
49-06053	0549-95-0305	0–0.5	Soil	Sodium-22	-0.024	U
49-06066	0549-95-0306	0–0.5	Soil	Americium-241	0.11	U
49-06066	0549-95-0306	0–0.5	Soil	Cesium-137	0.57	None
49-06066	0549-95-0306	0–0.5	Soil	Cobalt-60	0.044	U
49-06066	0549-95-0306	0–0.5	Soil	Europium-152	0.043	U
49-06066	0549-95-0306	0–0.5	Soil	Plutonium-238	0.009	None
49-06066	0549-95-0306	0–0.5	Soil	Plutonium-239	0.029	None
49-06066	0549-95-0306	0–0.5	Soil	Ruthenium-106	-0.274	U
49-06066	0549-95-0306	0–0.5	Soil	Sodium-22	0.017	U
49-06066	0549-95-0307	0–0.5	Soil	Americium-241	-0.054	U
49-06066	0549-95-0307	0–0.5	Soil	Cesium-137	0.491	None
49-06066	0549-95-0307	0–0.5	Soil	Cobalt-60	-0.001	U
49-06066	0549-95-0307	0–0.5	Soil	Europium-152	0.054	U
49-06066	0549-95-0307	0–0.5	Soil	Plutonium-238	0.002	None
49-06066	0549-95-0307	0–0.5	Soil	Plutonium-239	0.014	None
49-06066	0549-95-0307	0–0.5	Soil	Ruthenium-106	0.044	U
49-06066	0549-95-0307	0–0.5	Soil	Sodium-22	0.01	U
49-06067	0549-95-0308	0–0.5	Soil	Americium-241	-0.076	U
49-06067	0549-95-0308	0–0.5	Soil	Cesium-137	0.561	None
49-06067	0549-95-0308	0–0.5	Soil	Cobalt-60	0	U
49-06067	0549-95-0308	0–0.5	Soil	Europium-152	0.174	U
49-06067	0549-95-0308	0–0.5	Soil	Plutonium-238	0.005	None
49-06067	0549-95-0308	0–0.5	Soil	Plutonium-239	0.027	None
49-06067	0549-95-0308	0–0.5	Soil	Ruthenium-106	0.07	U
49-06067	0549-95-0308	0–0.5	Soil	Sodium-22	-0.005	U
49-06068	0549-95-0309	0–0.5	Soil	Americium-241	-0.003	U
49-06068	0549-95-0309	0–0.5	Soil	Cesium-137	0.028	U
49-06068	0549-95-0309	0–0.5	Soil	Cobalt-60	-0.002	U
49-06068	0549-95-0309	0–0.5	Soil	Europium-152	0.145	U
49-06068	0549-95-0309	0–0.5	Soil	Plutonium-238	0.016	None
49-06068	0549-95-0309	0–0.5	Soil	Plutonium-239	0.005	None
49-06068	0549-95-0309	0–0.5	Soil	Ruthenium-106	-0.001	U

Table B-2 (continued)

Location ID	Sample ID	Depth (ft)	Media	Analyte	Result (pCi/g)	Qualifier
49-06068	0549-95-0309	0–0.5	Soil	Sodium-22	-0.012	U
49-06069	0549-95-0310	0–0.5	Soil	Americium-241	-0.118	U
49-06069	0549-95-0310	0–0.5	Soil	Cesium-137	0.113	None
49-06069	0549-95-0310	0–0.5	Soil	Cobalt-60	-0.003	U
49-06069	0549-95-0310	0–0.5	Soil	Europium-152	0.082	U
49-06069	0549-95-0310	0–0.5	Soil	Plutonium-238	0.002	None
49-06069	0549-95-0310	0–0.5	Soil	Plutonium-239	0.004	U
49-06069	0549-95-0310	0–0.5	Soil	Ruthenium-106	0.119	U
49-06069	0549-95-0310	0–0.5	Soil	Sodium-22	0.028	U
49-06069	0549-95-0311	0–0.5	Soil	Americium-241	0.002	U
49-06069	0549-95-0311	0–0.5	Soil	Cesium-137	0.052	U
49-06069	0549-95-0311	0–0.5	Soil	Cobalt-60	-0.012	U
49-06069	0549-95-0311	0–0.5	Soil	Europium-152	0.083	U
49-06069	0549-95-0311	0–0.5	Soil	Plutonium-238	0.007	None
49-06069	0549-95-0311	0–0.5	Soil	Plutonium-239	0.004	U
49-06069	0549-95-0311	0–0.5	Soil	Ruthenium-106	0.057	U
49-06069	0549-95-0311	0–0.5	Soil	Sodium-22	-0.022	U
49-06070	0549-95-0312	0–0.5	Soil	Americium-241	0.036	U
49-06070	0549-95-0312	0–0.5	Soil	Cesium-137	-0.002	U
49-06070	0549-95-0312	0–0.5	Soil	Cobalt-60	-0.018	U
49-06070	0549-95-0312	0–0.5	Soil	Europium-152	0.084	U
49-06070	0549-95-0312	0–0.5	Soil	Ruthenium-106	-0.065	U
49-06070	0549-95-0312	0–0.5	Soil	Sodium-22	-0.004	U
49-06077	0549-95-0313	0–0.5	Soil	Americium-241	0.018	U
49-06077	0549-95-0313	0–0.5	Soil	Cesium-137	0.95	None
49-06077	0549-95-0313	0–0.5	Soil	Cobalt-60	0.021	U
49-06077	0549-95-0313	0–0.5	Soil	Europium-152	0.22	U
49-06077	0549-95-0313	0–0.5	Soil	Ruthenium-106	-0.139	U
49-06077	0549-95-0313	0–0.5	Soil	Sodium-22	-0.001	U
49-06079	0549-95-0314	0–0.5	Soil	Americium-241	-0.025	U
49-06079	0549-95-0314	0–0.5	Soil	Cesium-137	0.802	None
49-06079	0549-95-0314	0–0.5	Soil	Cobalt-60	0.032	U
49-06079	0549-95-0314	0–0.5	Soil	Europium-152	0.081	U
49-06079	0549-95-0314	0–0.5	Soil	Ruthenium-106	-0.006	U
49-06079	0549-95-0314	0–0.5	Soil	Sodium-22	0.019	U

<sup>a</sup> U indicates not detected.

## **Appendix C**

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*Surface Water Assessment Erosion Matrix  
for AOC 49-008(b)*



